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Sulphate of soda,	Trace
Bicarbonate of lime,	14.238
Bicarbonate of iron,	1.006
Bicarbonate of magnesia,	.305
Silica,	.951
Organic matter,	1.166
Total solids,	109.132
Sulphuretted hydrogen,	Trace
Carbonic acid gas,	Trace
Temperature,	67½°

This may be classed as a sulpho-saline water, containing borax as a rare ingredient. On comparison with other waters, we find that it is similar to some springs in Kentucky, only not as strong. These do not contain borax. The Fort Scott water is probably a mixture of streams from different depths.

NOTES ON THE FOSSIL JAW OF BISON, FROM THE PLIOCENE OF NORTON COUNTY.

BY ROBERT HAY.

Over a year ago we picked up a jaw, semi-fossilized, in the talus from bluffs in which the line of separation, or rather contact, of the Loup Fork Miocene and the Equus beds of Pliocene above, was not difficult to trace. It was therefore not possible to determine which of the two formations yielded the bone, or whether it might not have been in the soil at the top. The remarkable wearing of two of the teeth led us to preserve the specimen, and Dr. Turner, who was with us at the time, very soon afterwards found another jaw with the same wear on the teeth, and that he dug out out of the Pliocene. Drawings and descriptions of both fossils have been submitted to Professor Cope separately, and he pronounces each to be bison. The remarkable wearing of the teeth we have thought pointed to some habit of browsing and pulling of the branches of trees, but Professor Cope suggests that it was caused by eating herbage, mixed with sand and gravel, before the other teeth were cut. It is probably all that is left of the most ancient Kansas buffalo. The following are the dimensions of the first-found specimen, in millimetres:

RIGHT MANDIBULAR RAMUS OF BISON.

	Mm.		*Mm.*
Total length,	400	Length of tooth No. 3, at surface,	16
Total height,	230	Length of tooth No. 4, at surface,	23
Height at posterior extremity,	210	Length of tooth No. 5, at surface,	26
Breadth, exclusive of teeth,	67	Length of tooth No. 6, at surface,	38
Breadth, inside,	74	Height of No. 6,	23
Length of line of teeth at base,	45	Width of No. 6,	16
Length of tooth No. 1, at surface,	11	Thickness of ramus,	36
Length of tooth No. 2, at surface,	15		

A NEW METHOD OF STUDYING ABSORPTION SPECTRA.

BY W. S. FRANKLIN.

This method is the one used by Prof. Edw. L. Nichols in studying the light emitted by glowing platinum,* and in his measurements of the reflection spectra of pigments.† Figure 1 in the accompanying plate represents the slit of the spectrophotometer, with attachments, as modified for the quantitative study of absorption spectra.

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*American Journal of Science and Arts, Vol. XVIII, Dec. 1879.

†American Journal of Science and Arts, Vol. XXVIII, Nov. 1884.

Fig. 1.

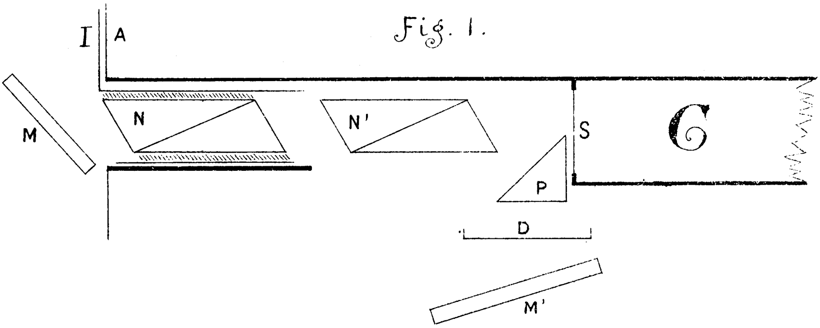
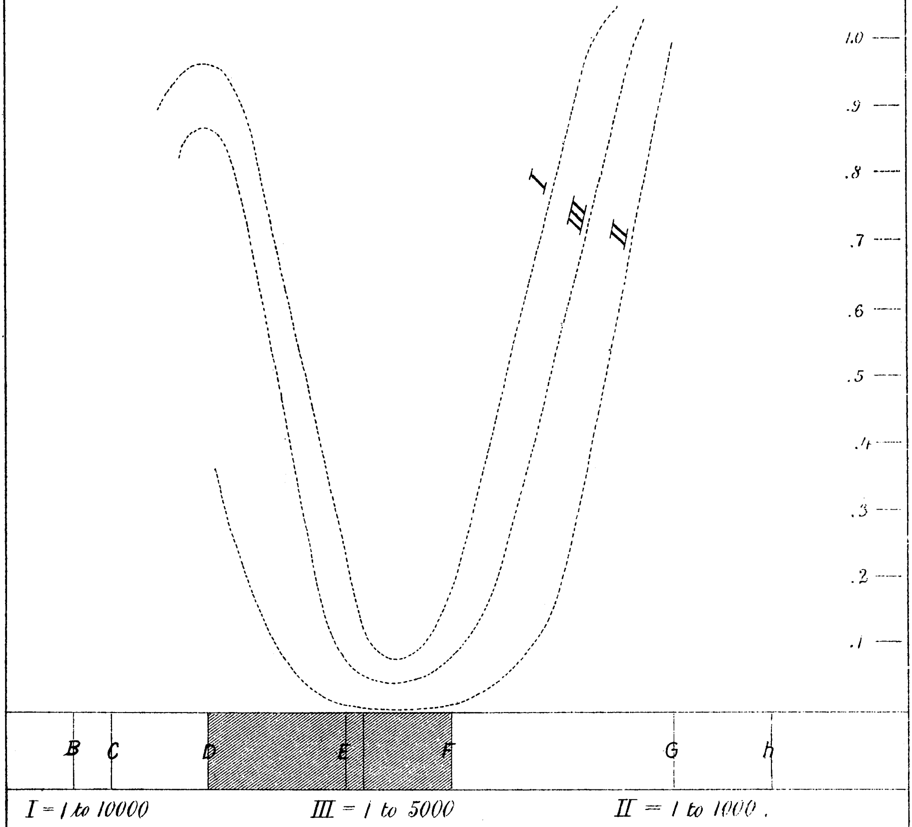

I
A
M
N
N'
S
G
P
D
M'

Fig. 2.


1.0
.9
.8
.7
.6
.5
.4
.3
.2
.1
I
III
II
B
C
D
E
F
G
h
I = 1 to 10000
III = 1 to 5000
II = 1 to 1000.

M M′ are blocks of magnesium carbonate, of a pure white color. The light from *M* passes through the movable nicol *N*, the position of which is indicated by an index upon a divided circle, thence through the stationary nicol *N′* into the upper half of the slit. Thus the brightness of the direct spectrum is under the control of the operator.

The light from *M′* passes through the colored medium *D*, and striking the back of the right-angled prism *P*, is totally reflected into the lower half of the slit of the spectroscope. At the focus of the spectroscope a narrow vertical slit is placed, through which but a small portion of each spectrum is visible. These portions can be compared and made equal in intensity by turning the movable nicol *N*. Thus we can find the relative amount of light of each wave-length transmitted by the medium *D*.

Of course the movable prism *N* may be used at the eyepiece with convenience, but in the case of permanganate of potassium, the light from *M′* seemed to be partially polarized by its passage through *D*, and through the dispersing prism of the spectroscope. This was so marked in one case, that when observing the two spectra, between *F* and *G* with the movable nicol at the eyepiece, both would appear and vanish together.

The curves exhibited in the plate, (fig. 2,) show the light transmitted by solutions of permanganate of potassium, of 1 to 1,000, 1 to 5,000, and 1 to 10,000; each having a thickness of 1 cm., determined by the method described above. The shaded spectrum, given below, is taken from "The Nature of Light," by Dr. Eugene Lommel, page 175. It shows the usual method of mapping the absorption spectrum of permanganate of potassium. One can see at a glance that such maps give a very imperfect idea of the real nature of absorption spectra.

It will be seen by the above curves that a solution of permanganate of potassium is nearly opaque to yellow-green rays, while the amount of red rays transmitted by concentrated solutions is much less than that transmitted by dilute solutions. Violet light, however, seems to be transmitted equally well by all solutions. This gives dilute solutions a decided red color, while concentrated solutions approach a pure violet. It seems by this that yellow-green rays are reflected, red absorbed, and violet transmitted; but the reflection spectrum has not yet been measured, and to the eye it appears almost white.

It is my intention to study the absorption and reflection spectra of a series of compounds, for instance the chromates, permanganates, ferrates, etc., and also the salts of the metals themselves, to find if there is such relation between them as will furnish a clue to the cause of selective absorption and reflection.

One cannot study color without wondering why or how a body can show preference to wave-lengths in reflection and transmission. Why a body should reflect violet, for instance, in preference to red or yellow, is an open question.

The phenomena of opacity and transparency, and the property of absorbing all and reflecting all wave-lengths, as lamp-black and silver are capable of doing, are doubtless closely related to the subject of selective absorption. What molecular relations can there be between black and white, and opaque and transparent bodies? It is surely only a molecular difference. Can the molecules of lamp-black be so loosely hung that they sway under the impingement of any wave-length of light, while those of silver are almost immovable? Another thing, not less remarkable than this, is the color relations between the compounds of many of the elements; for instance, many of the metals of the iron group have highly-colored salts. Ferrates, chromates, etc., are particularly remarkable for their color, as are also the salts of the aniline bases.

We can understand selective reflection only by supposing that the vibrations of the molecules of some bodies deaden the wave-length in unison with them, while other wave-lengths may be either reflected or transmitted. This can be readily illustrated by sound. Suppose sound waves of different lengths to strike a screen made of wires stretched very close together and all in unison, then the wave of sound in unison with them would be absorbed while the remaining would be partly reflected and partly transmitted. This is probably the true explanation of selective absorption in gases, and it may be the explanation of selective absorption in solids and liquids. One thing that we should expect in the case of solids is, that more than one wave-length would be absorbed, because the molecules would not have a definite rate of vibration, but would vibrate at any rate between certain limits, though with unequal facility. That is, the vibration would be stunted by the attraction of the surrounding molecules.

It is a well-known fact that gases when heated radiate those wave-lengths which they are capable of absorbing when cold. Now if the above theory of selective absorption and reflection be true, we should expect a colored solid when heated to radiate light nearly complementary to that which it reflects when cold. This *seems* to be the case with copper, which has a greenish tint when melted, but whether there is such a thing as selective radiation from solids is not certain. The only way to settle this is by a spectrophotometric study of the light emitted by colored bodies in a state of incandescence.

SOME SPECIAL TESTS IN REGARD TO THE DELICACY OF THE SENSE OF SMELL.

BY E. H. S. BAILEY AND L. M. POWELL.

[Abstract.]

At the Philadelphia meeting of the American Association for the Advancement of Science, E. H. S. Bailey and E. L. Nichols presented the results of some experiments on the special senses. The object of the present investigation is to continue these experiments with special attention to the sense of smell. It is doubtless true that, in the process of smelling and tasting, actual contact with the substance must take place, and the substance must be soluble, or must be floating in the air in minute particles.

As we wish to form some idea in regard to the delicacy of this sense, and the effect of education upon it, and to compare it with chemical tests for the determination of substances, we have used as test solutions the following:

Oil of lemon, 1 part in 4,000 parts of water; oil of wintergreen, 1 part in 2,700 parts of water; Prussic acid, 1 part in 512 parts of water; caustic potash, a dilute solution.

The oils were obtained in solution in water by grinding with magnesia, and filtering. All the solutions were successively diluted so that each bottle was one-half the strength of the previous one in the series, and the dilution was continued till it was impossible to detect the substances by smell. Tests were made by 21 females and 27 males, each one attempting to classify in four groups, as above. Although the number tested is too small to justify an absolute conclusion, yet it is valuable as indicating probable results. The average was as follows:

AMOUNT DETECTED.

	Prussic acid.	*Oil of lemon.*	*Oil of wintergreen.*
Average of 27 males, ...	1 part to 112,000 of water.	1 to 280,000	1 to 600,000
Average of 21 females, ...	1 part to 18,000 of water.	1 to 116,000	1 to 311,000
General average, ...	1 part to 65,000 of water.	1 to 198,000	1 to 455,500

Three of the males were able to detect one part of Prussic acid in about 2,000,000 parts of water. Two of these were persons engaging in occupations favoring the cultivation of this sense. Careful chemical tests were made for Prussic acid, but it was not detected below the bottle containing 1 part HCN in 131,000 parts of water. More delicate tests can probably be made by the use of the microscope.